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|-------------------------------|------------------------|---------------------|--|
| Notice of Allowability | Application No. | Applicant(s) | |
| | 10/825,924 | GRAINGER ET AL. | |
| | Examiner | Art Unit | |
| | Ted Kim | 3746 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

- 1. ☒ This communication is responsive to 01/26/2006.
- 2. ☒ The allowed claim(s) is/are 1-12 and 15-17.
- 3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☐ All b) ☐ Some* c) ☐ None of the:
 - 1. ☐ Certified copies of the priority documents have been received.
 - 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 - 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

- 4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
 - 5. ☒ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
 - (b) ☒ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
- 6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

- | | |
|--|---|
| 1. <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 5. <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 2. <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 6. <input checked="" type="checkbox"/> Interview Summary (PTO-413), Paper No./Mail Date _____. |
| 3. <input checked="" type="checkbox"/> Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date <u>01/26/2006</u> | 7. <input checked="" type="checkbox"/> Examiner's Amendment/Comment |
| 4. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit of Biological Material | 8. <input checked="" type="checkbox"/> Examiner's Statement of Reasons for Allowance |
| | 9. <input type="checkbox"/> Other _____. |

EXAMINER'S AMENDMENT

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Fred Hernandez on 3/8/07.

The application has been amended as follows:

CLAIMS

1. (amended) An attitude control and propulsion system for a spacecraft, comprising:

- a supply of oxidizer;
- at least one attitude control nozzle that expels only the oxidizer;
- a conduit fluidly coupling the supply of oxidizer and the attitude control nozzle, wherein the conduit provides a pathway for oxidizer to flow in a downstream direction from the supply of oxidizer toward and into the attitude control nozzle;
- a pressure regulator coupled to the conduit and interposed between the supply of oxidizer and the attitude control nozzle, wherein the pressure regulator regulates the pressure of oxidizer at a location downstream of the pressure regulator and upstream of the attitude control nozzle to a set point pressure at or below a first pressure, wherein the first pressure comprises the pressure required to maintain the oxidizer in a gas state to ensure that the any oxidizer flowing through the conduit is in a gas state prior to entering the attitude control nozzle; a gaseous oxidizer accumulator coupled between the pressure regulator and the attitude control nozzle;

wherein the attitude control nozzle is positioned so that thrust produced by the attitude control nozzle adjusts the attitude of the spacecraft and the attitude control nozzle produces its thrust through the expansion of the oxidizer, without combustion of the oxidizer, as the oxidizer in the gas state is expelled from the attitude control nozzle; and

a hybrid rocket motor having a main nozzle, the hybrid rocket motor including a combustion chamber in which the oxidizer interacts with a solid fuel to generate thrust via the main nozzle.

12. (amended) A method of controlling attitude and providing propulsion of a spacecraft, comprising:

providing a supply of oxidizer, wherein the supply of oxidizer contains oxidizer in both a liquid state and a gas state;

flowing oxidizer from the supply of oxidizer to a hybrid rocket motor of the spacecraft, wherein the hybrid rocket motor includes a combustion chamber and a main nozzle;

flowing oxidizer from the supply of oxidizer to an attitude control nozzle of an attitude control system of the spacecraft;

regulating the pressure of oxidizer flowing to the attitude control system, wherein the pressure is regulated to a pressure below the vapor pressure of the oxidizer for a temperature of the oxidizer at a location upstream of the attitude control nozzle to ensure that the oxidizer is in a gas state when flowing into the attitude control nozzle of the attitude control system, flowing the oxidizer into a gaseous accumulator downstream of the pressure regulator; and

expelling only the oxidizer, in a gas state, from the attitude control nozzle to produce thrust through the expansion of the gaseous oxidizer without combustion of the gaseous oxidizer.

- Claim 13 has been canceled.

Drawings

2. The following changes to the drawings have been required by the examiner:

Formal drawings are required. The line quality and spurious dots renders of the replacement drawings renders them informal although the content is appropriate.

REASONS FOR ALLOWANCE

3. The following is an examiner's statement of reasons for allowance: the prior art of record do not fairly teach in permissible combination the claimed invention. In particular, the Hamke et al reference teach the thrusters 18, 19 some of which are hybrid rocket motors with the alternative use of a single propellant/oxidizer (col. 4, lines 44-67). None of the art of record teach a gaseous oxidizer accumulator coupled between the pressure regulator and the attitude control nozzle nor flowing the oxidizer into a gaseous accumulator downstream of the pressure regulator and expelling only the oxidizer, in a gas state, from the attitude control nozzle. Previously applied, Fix et al teach a liquid accumulator 12 and regulator 14 whereas Whitehead et al teach an accumulator 9 but do not teach its relationship with the pressure regulator. When considering the specific system as whole and the steps needed to modify the system to meet the claim limitations, the claim combinations are unobvious over the art of record.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably

accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Contact Information

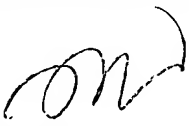
Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Ted Kim whose telephone number is 571-272-4829. The Examiner can be reached on regular business hours before 5:00 pm, Monday to Thursday and every other Friday.

The fax numbers for the organization where this application is assigned are

571-273-8300 for Regular faxes and 571-273-8300 for After Final faxes.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Thorpe, can be reached at 571-272-4444.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist of Technology Center 3700, whose telephone number is 703-308-0861. General inquiries can also be directed to the Patents Assistance Center whose telephone number is 800-786-9199. Furthermore, a variety of online resources are available at <http://www.uspto.gov/main/patents.htm>



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|-------------------------------------|-------------------|--------------|
| Ted Kim | Telephone | 571-272-4829 |
| Primary Examiner | Fax (Regular) | 571-273-8300 |
| March 8, 2006 | Fax (After Final) | 571-273-8300 |
| Technology Center 3700 Receptionist | Telephone | 703-308-0861 |
| Patents Assistance Center | Telephone | 800-786-9199 |

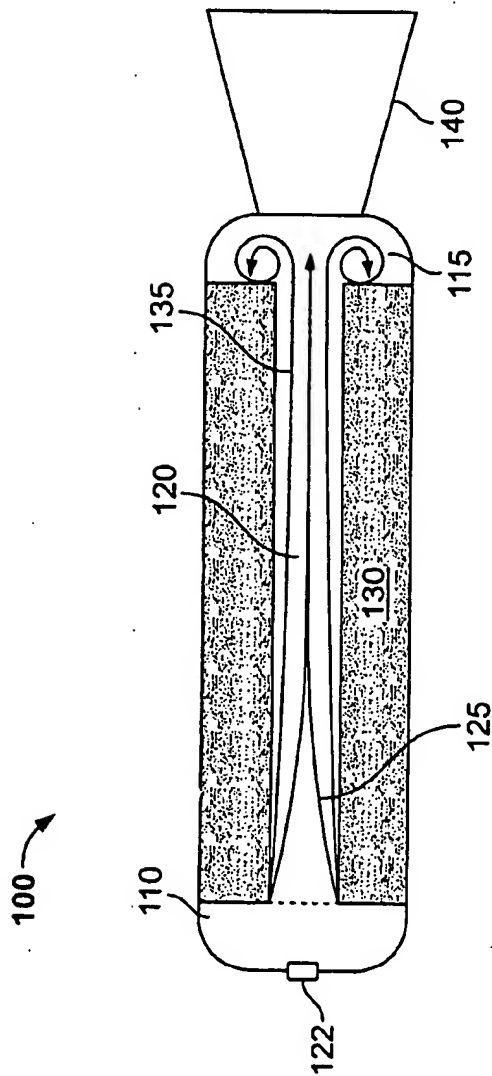


FIG. 1

Entry NOT
approved.

FORMS
required.

SA
3/8/06